

OHIO SLACK WATER DAMS, LOCK AND DAM No. 4

HAER No. PA-227-A

East bank of the Ohio River at mile point 18.6, along Route 65

Ambridge Vicinity

Beaver County

Pennsylvania

HAER

PA

4-AMB.V

1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service

Northeast Region

U.S. Custom House

200 Chestnut Street

Philadelphia, PA 19106

HAER
PA
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HISTORIC AMERICAN ENGINEERING RECORD

OHIO SLACK WATER DAMS, LOCK AND DAM NO. 4 HAER No. PA-227-A

Location: East Bank of the Ohio River at Mile point 18.6, along Route 65, Ambridge vicinity, Beaver County, Pennsylvania.

UTM: 17.565230.4496550
Quad: Ambridge, PA, 1:24,000

Date of Construction: 1898-1908

Engineer: Colonel William L. Sibert, U.S. Army Corps of Engineers.

Architect: U.S. Army Corps of Engineers

Present Owner: River Salvage Company, Pittsburgh, PA

Present Use: Abandoned, proposed barge dock.

Significance: Ohio Slack Water Dams, Lock and Dam No. 4, HAER No. PA-227-A was part of the fifty-two slackwater locks and dams constructed by the U.S. Army Corps of Engineers on the Ohio River, between 1877-1917. The Lock and Dam complexes on the Ohio River insured year-round depths of 9.0 feet from the Mississippi River to Pittsburgh, Pennsylvania.

Project Information: Ohio Slack Water Dams, Lock and Dam No. 4, HAER No. PA-227-A was recorded in December 1992 by SE Technologies, Inc.'s Cultural Resource Management Group. The team consisted of Arthur B. Fox, M.A., Historical Archaeologist and James P. Dwyer, M.A., Archaeologist. River Salvage Company of Pittsburgh proposes to set four barges atop the old lock wall to raise the dock elevation to above ordinary high water. To mitigate adverse effect on this resource, an MOA between the U.S. Army Corps of Engineers and River Salvage Company was completed. A HAER documentation will be submitted to the National Park Service, and a Phase I Archaeological Survey report will be submitted to the State Historic Preservation Officer, Harrisburg, PA.

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DESCRIPTION:

The remains of Ohio Slack Water Dams, Lock and Dam No. 4, are located on the east bank of the Ohio River at mile point 18.6, in Harmony Township, Beaver County, Pennsylvania. It is approximately 1 mile northwest of Ambridge, Pennsylvania and 100 ft directly west of Route 65. The CONRAIL (formerly the Pittsburgh, Fort Wayne, & Chicago Railway and later the Penn Central Railway lines) tracks are located directly east, adjacent to the remains of the Old lock #4 complex.

Much of the original infrastructure of Ohio Slack Water Dams, Lock and Dam No. 4, were demolished by the U.S. Army Corps of Engineers in 1936, subsequent to damages that occurred during the "Great Flood of 1936." The entire 700 ft dam, piers #1, #2, and #3, in addition to bear traps #1 and #2, the adjacent Chanoine weir, and the dam abutment on the west bank of the Ohio River, were removed. With the removal of the 597 foot river wall, the associated lock chamber on the east bank of the river ceased to exist. The remaining structures associated with the Ohio Slack Water Dams, Lock and Dam No. 4 complex on the eastern shore of the Ohio River, posed no hazard to river navigation and thus, were left intact. Although the lock gates remained temporarily, they were removed at a later (unrecorded) date, possibly during World War II for their value as scrap metal. The practice, during the early twentieth century, was to take out the absolute minimum of the old structures (Johnson & Minnotte 1989: 33).

Features of the original lock that remain in-situ and currently are preserved, consist of (1) the 597 ft esplanade wall, walk, and steps to the former powerhouse; (2) the 700 ft long upper guide wall (southern most); (3) the upper gate recess; (4) 100 ft of the original 600 ft lower guide wall (northern most); (5) The lower gate recess; (6) foundation footprints of the two locktenders' houses; and (7) subsurface remains of the drift chute. No footprint of the former powerhouse could be detected due to piles of concrete, brick, debris and vegetation obscuring this area.

No remains of the dam associated with the Ohio Slack Water Dams, Lock and Dam No. 4, complex are preserved and subsequently could not be documented during the November 1992 cultural resource survey of the area. According to James Zubic, River Salvage Inc. (personal communication, November 1992), the U.S. Army Corps of Engineers removed the majority of the dam (including most of the foundation) when dismantling the complex in the mid-1930s.

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HISTORICAL INFORMATION:

The United States Army Corps of Engineers initiated the Ohio River navigation project in 1825 with channel improvements, followed in 1830 by the construction of a canal and three locks to pass the "Falls of the Ohio" at Louisville, Kentucky.

Because the Ohio River was too shallow almost every summer and fall for navigation, Congress in the River and Harbor Act of 1875, appropriated \$100,000 toward building a movable dam at Davis Island (4.7 miles below Pittsburgh, Pa.) to test the best method of improving the Ohio River and its tributaries. In the River and Harbor Act of 1881, Congress recommended the construction of Locks and Dams #2-6. Appropriation for Locks #2 - 6 inclusive were made by various River and Harbor Acts beginning in 1890. The River and Harbor Act of 1896 authorized a survey from Pittsburgh to Marietta, Ohio to determine the number of movable dams needed to provide a 6 ft navigable depth (U.S. Army Corps of Engineers 1979: 26).

Twelve lock and dam complexes were constructed before 1910, and canalization of the river was completed in 1929. Davis Island Lock and Dam #1 completed in 1885 was the first complex built on the Ohio River in western Pennsylvania, followed by the construction of lock and dams #2-6. When completed, these structures assured a year round depth of 9 ft (Ohio River) from the Mississippi River to Pittsburgh, Pennsylvania. The dams were constructed of wooden wickets that were raised to hold back water during periods of low flow and dropped to the river bottom during high water, permitting open river navigation without the need for locking. The dams were of the movable type, with a navigable pass varying from 600 to 1,248 ft and one or more regulation weirs. At each dam a lock with usable dimensions of 110 ft x 600 ft was provided (U.S. Army Corps of Engineers 1971: 4).

Ohio Slack Water Dams, Lock and Dam No. 4 at Legionville, Pennsylvania was the fourth movable dam constructed on the Ohio River. Started in 1898, the dam was completed in February 1908 at a cost of \$1,071,472.00 and operated until 1936 when it was eliminated by the opening of the Montgomery Lock and Dam (mile point 31.7, Ohio River), in June 1936.

Congress had approved construction of lock and dams #2-5 in 1896, but funding had been meager and none of the dams below Davis Island #1 were finished by the end of the nineteenth century. Ohio River Locks and Dams #2-7, those located upstream of the Pennsylvania State line, were transferred on February 29, 1903, from the Wheeling to the Pittsburgh District, under the command of Major William L. "Goliath" Sibert, a graduate of the U.S. Military Academy at West Point. Sibert, already involved in reconstruction of the navigation project on the Lower Monongahela and Upper Monongahela rivers, assigned Lieutenant George R. Spalding, veteran of military projects in the Philippine Islands, to dam construction on the Ohio River in 1903. In 1905, Congress approved increasing the depths of the pools behind Locks and Dams #1-6 to 9 ft, through use of longer wickets and a few structural modifications (Johnson 1987: 157-58).

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Plans for Ohio Slack Water Dams, Lock and Dam No. 4 were drawn as early as May 14, 1895, detailing the future location of the complex. The contract for this project was dated December 7, 1897 and work commenced at the dam in April 1898 (Bausman 1904: 250). Lock features were planned for the east bank of the Ohio on 5.731 acres of property owned by "Land of the Union Company" (the Harmony Society). The location of this parcel was directly west of the Pittsburgh and Fort Wayne and Chicago Railway tracks and adjacent to Legionville Station. The United States Government purchased approximately 4 acres of this land stretching 2,687 ft in a north-south direction. Property on the west bank of the Ohio River, however, was still in the planning stage.

U.S. Army Corps of Engineers plans from 1899, detail the test borings conducted for the coffer dam, lock chamber, and abutment on the east bank. The coffer dam, constructed prior to work on any dam, was a temporary structure built to control the river while work was completed on the final lock and dam structure. By 1901 the upper and lower lock recesses had been built and construction of the river wall, the powerhouse and a 250 section of dam extending from the river wall into the Ohio River, was completed by late-1903. By 1905, Congress had approved increasing the depths of pools on the Ohio River to 9 ft, thus initiating the remaining work for the completion of Ohio Slack Water Dams, Lock and Dam No. 4. The Jones and Laughlin Steel Company that owned part of the property on the west bank of the Ohio River slated for construction of the dam abutment, sold the land to the United States Government. The abutment of the dam on the west bank was completed in 1907 and the entire complex of Ohio Slack Water Dams, Lock and Dam No. 4, was operational by February 1908.

The construction and subsequent opening of the Montgomery Locks and Dam at mile point 31.7, Ohio River in June 1936, eliminated the need for Locks and Dams #4,5,& 6. Lock and Dam No. 4 was partially dismantled in 1936 and suffered additional destruction during the 1936 flood that crested at 39 ft on the banks of the Ohio and destroyed the small town of Legionville located directly south of the lock complex.

The entire 1,100 ft length of dam including the river wall, piers #1-3, bear traps, and Chanoine wickets were removed from the lock and dam complex, leaving the two lock recesses, the upper and lower guide walls, the land wall and esplanade, powerhouse, and locktenders' houses relatively intact, although no longer in operation. Fill and dumping episodes (although undocumented) from the Penn Central and later CONRAIL railroad lines, and construction of Route 65 in the late-1940s, are believed to have disturbed much of the above ground lock complex, (i.e., the three abandoned buildings). The present (1992) condition of the lower gate recess, approximately half filled with trash, earth, and vegetation, attests to the extreme disturbance of the site. Although the locktenders' houses and the powerhouse remained partially intact until the 1980s, the structures were severely disturbed and vandalized (Patrick Riley, personal communication, November 1992). In spring of 1992, River Salvage Company, property owners, bulldozed the remaining structures as a liability measure in lieu of their continuous use by displaced individuals.

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It is not known the extent of foundation (if any) that may remain from the dam under the crest of the Ohio at mile point 18.6. The present pool at this location is 682.0 ft. above mean sea level and the approximate depth of the water is 30 ft. A recent (1992) aerial photograph taken for the Beaver County Soils and Conservation Department, (Beaver, Pennsylvania) at the general location of old Ohio Slack Water Dams, Lock and Dam No. 4 complex, indicates a "breakwater" in the current of the Ohio River. This easterly to westerly break in the river is located at the former dam crest line extending across the Ohio River. This may indicate that a segment of the dam's foundation remains intact under the this portion of Ohio River. This, however, could not be documented by the present scope of work. Only a remote sensing reconnaissance augmented by a visual inspection and photographic documentation could confirm the structural integrity of this feature. The U.S. Army Corps of Engineers, Pittsburgh District, had no recorded information concerning the foundation remains of former dam #4.

HISTORICAL INFORMATION:

The lock complex of Ohio Slack Water Dams, Lock and Dam No. 4 was constructed between 1899 and late-1903. The size of the main lock chamber, which was uniform throughout the entire series of Ohio River dams was 600 ft in length, and 110 ft in width. The lock chamber was constructed from a concrete river wall approximately 12 ft thick, separated from the cement land wall by 110 ft. The width of the chamber at 110 ft was determined by the normal Ohio River coal tow, usually four barges abreast (100 ft wide) without breaking tow, with 10 ft to spare for the towboat. The lock chamber when in operation was closed at both ends by rolling gates. The difference between levels of the upper and lower pools was overcome by admitting water to, or discharging water from, the closed lock chamber by means of valves.

Rolling lock gates, designed by Colonel William E. Merrill of the U.S. Army Corps of Engineers in 1875, consisted of a 117 ft long rolling lockgate; a wooden Howe truss laid on its side and mounted on iron wheels and axles. A steel caisson gate with Pratt truss, replaced the wooden gate utilized at Davis Dam #1, and was used at Ohio Slack Water Dams, Lock and Dam No. 4. The lockgate was moved by chains and drums in and out of the lock recesses on an 11.5 ft gage rail track (traces of which are still evident on the floor of both lock recesses). Housed in stone recesses in the riverbank (covered by a wooden roof), when the lock was open, the rolling gates ran out on tracks like a railroad car across the chamber and into a niche in the lock riverwall thus closing the lock (Johnson 1987: 138).

The upper gate recess (southern most and downstream) and the lower gate recess (northern most and upstream), were identical in their basic structural design. The recesses were 114 ft in length, 34 ft wide, and 20 ft deep (15.75 ft to normal pool level). The cut stone block of the recess walls were covered with concrete. The concrete in several places along the present walls on both the upper and lower gate recesses have cracked or fallen off, exposing the cut stone blocks beneath. The drift chute in the recess was located in the base of the northeastern corner of the upper gate recess and controlled the flow of water into and out of the lock chamber by means of the flushing conduit. The drift chute functioned as a "filter" to remove debris from the river that would eventually clog the lock structure. Water from the Ohio River passing upstream would pass through the upper gate recess into the 600 foot subterranean drift chute and was discharged downstream into the Ohio River by the lower gate recess. The drift chutes, due to

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their semicircular arch construction, required a cribbing back to support the walls of the recess. Dimensions at the mouth of the chute measured 12 ft at its maximum width, and 9.6 ft maximum height. Alternating 1 ft x 1 ft x 28 ft planks and 0.5 ft x 1 ft x 1 ft stone blocks horizontally above the drift chute and between 2.0 in x 1 ft hemlock sheeting, composed the structure around the chutes. Hemlock was probably favored in the lock construction due to its consistency and ability to hold spikes exceptionally well. Although the subterranean drift chute is still intact, it is "silted" up (Captain Jack Ross, personal communication, March 1993).

The gate lock recesses formed a ninety degree (90°) angle with the guide walls. The upper guide wall topped with stone coping approximately 5 ft wide, consisted of two layers; 5.2 ft in height, and were interlaced with steel support rods (some presently exposed). The stone coping rested on a concrete base, bordered on the river face by both vertical and horizontal oak planks and piles. Many of these features are still preserved beneath the waters surface along the guide wall. The upper guide wall extends approximately 700 ft, oriented in a north/south direction. The lower guide wall was constructed identical to the upper guide wall except that the length of the lower wall was approximately 600 ft (only 100 ft. presently remain).

The lock chamber of the complex was formed by the construction of a river wall, and the adjacent land wall, built a distance of 110 ft away, on the east bank of the river. The river wall of the lock no longer exists, but U.S. Army Corps of Engineers plans indicate that the wall was 600 ft in length, 12.75 ft in width at the top (coping) and 14.6 ft wide at the base. The top 20 ft of wall was constructed of interlayered 1.5 - 2 ft thick blocks of stone at 1.5 - 2 ft intervals in the concrete structure. This section of wall was approximately 11 ft thick. The side of the river wall that formed the lock chamber was faced with 1 ft x 1 ft oak timbers extending for the entire 17.5 ft depth of the lock chamber. Supporting this structure was a 12 ft x 14.5 ft base of concrete.

The lock chamber (when filled from the upper pool of the Ohio River), recorded an elevation of 684.393 ft above MSL, and 676.452 ft above MSL when filled from the lower pool, a differential of 7.94 ft. The upper sill of the lock was placed at 667.752 ft above MSL and the lower sill at 667.252 ft above MSL. Riprap (piles of stone) was placed below the sills to a thickness of approximately 1.5 ft. The basal portion consisted of 10 ft of gravel and 3 layers of 3.0 in (0.75 ft total) hemlock planks below the gravel.

The land wall was also constructed of two sections of concrete; the upper measuring 17.5 ft in length and 10.75 ft in width. The lower section of concrete measured 12 ft in length x 11 ft in width. The land wall lock chamber face was also constructed of 1 ft x 1 ft oak timbers, some of which are still preserved under the surface of the Ohio River adjacent to the existing wall. The stone coping of the land wall placed in 1907, consisted of two layers of blocks measuring approximately 5 ft in width and 2.5 ft in thickness. Openings (wells) were left in the walls measuring 5 ft x 7 ft for the operation of the lock machinery. Sections of stone were either made from coping on hand or were ordered.

A temporary coffer dam was placed approximately 52 ft from the river wall of the lock chamber on the river side. The coffer dam was constructed of timber pile and wooden framework filled with soil pumped in and agitated by water to form a solid waterproof seal in the dams framework (Johnson 1987: 140). The "Ohio River box-type" cofferdams differed little from cofferdams used by Roman engineers twenty centuries earlier. Timber framing, held together with iron rods and

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wooden spacers, about 20 ft wide and 16 ft high, was built and sheathed on the sides with planks aboard barges and moved forward. After dredges filled the boxes with material from the riverbed, the boxes were decked over and banked on both sides with dredged fill. The interior of the cofferdams was "unwatered" by pumps mounted on boats; excavation inside the coffer was finished; and rows of round wooden bearing piles were driven to bedrock by a derrickboat with swinging leads. Cement and aggregate moved to concrete mixers placed on the cofferdams in small carts pulled by men and mules along a railtrack laid atop the cofferdam; derricks swung the buckets of concrete to the wooden forms spiked to the top of the piles for the lock foundation; concrete for the dam foundation was moved by the highlines from towers (Johnson 1987: 163).

Locktenders and their families lived on-site at the lock and dam complexes on the Ohio River. The locktenders' houses at Lock #4 were similar in design and construction and consisted of a three-story brick and frame building, with a basement, in addition to front and back porches. The dimensions of the houses were approximately 33 ft in length x 33 ft wide, according to the only U.S. Army Corps of Engineering plans available. The 1992 archaeological survey recorded the southern most locktender house foundation at 33 ft in width and 33 ft in length. A 16 ft x 33 ft attachment probably functioned as a foundation for the front porch. The northern most locktender foundation was partially preserved (front section) and measured 37 ft in length x 16 ft in width. The front of the houses, according to available plans, consisted of three double-pane windows and door on the first level, and a row of four double-pane windows on the second story. The gabled roof was designed with two dormers, each with double lights, on the north and south face of the house. Both structures had front steps leading down to the esplanade, and the edge of the land wall was located approximately 110 ft from the front door of each house, according to plans. The actual location of the houses, however, did not concur with existing plans. The northwest corner of the "northern" most locktenders house was approximately 46 ft from the "back" section of the lower gate recess. In contrast, the southeast corner of the "southern" locktender's house was 117 ft from the anterior section of the upper gate recess. The locktenders' houses are no longer preserved, but foundation footprints were recorded and photographed. Remains of partial brick stairwells were evident during the 1992 survey, but no additional building features of the houses were evident except for piles of brick and concrete debris that have severely disturbed the basement cavities in both structures. Heavy vegetation and fill from adjacent railroad and road construction activities have totally destroyed the above ground architectural integrity of these former structures. It is also apparent from the survey that the majority of the infrastructure, as well as the exterior structural materials of these buildings have been vandalized, washed away by subsequent flooding conditions of the Ohio River, or otherwise destroyed by various undocumented activities over the past half century since their closing.

The powerhouse at lock #4 was approximately 60 ft in length x 35 ft in width, according to available plans when constructed in the early 1900s to house all power-generating equipment necessary for the operation of the lock and dam. The four-story building with gabled roof and dormers was constructed of red brick and wooden frame with a 24 ft deep concrete foundation. The powerhouses exterior design included three large arched doors on the first level, two sets of three lights on the second level, as well as on the third level. The third level, in addition to six bay windows facing the Ohio River (west) also had a large enclosed balcony with three large

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floor to ceiling windows. This served as the "observation deck" of the powerhouse. Steps (partially intact) lead directly down the slope in front of the house, to the esplanade of the land wall approximately 100 ft from the front door of the powerhouse. Although the footprint of the entire powerhouse foundation complex would have encompassed approximately 2,100 ft², it could not be documented at the location of the former structure due to the extreme disturbance from large piles of brick and concrete rubble, large fragmented sections of red brick wall, and dense vegetation that predominates the site.

Although few above-ground features remain of the locktenders' houses or the powerhouse, the associated drift chute may still be preserved beneath the surface. The top of the drift chute would be located approximately 22 ft below the present ground surface. A circular chute is evident directly adjacent to the northeastern corner of the foundation of the southern most locktenders house. Although this cavity appeared to be approximately 20 ft in depth, no attempt was made to measure or enter this feature due to the danger involved. No evidence of this cavity appears on preserved drawings, but it would appear to have functioned as a water well for the locktender.

The men who operated the old locks and wicket dams, lived near the locks, forming a tightly knit, somewhat isolated community under the direction of the Lockmasters. The old wicket dams required (in comparison with modern structures), a large work force to raise and lower the dams and another large force in the repair parties which kept the wicket dams and rolling lock gates serviceable (Johnson & Minnotte 1989: 34).

HISTORICAL INFORMATION:

The dam section of Ohio Slack Water Dams, Lock and Dam No. 4 consisted of the construction of a 652 ft section of dam (including Chanoine wickets) extending from the river wall on the east side of the Ohio River to pier #1. The width of the dam was uniform at 50 ft. Pier #1, 48 ft in length and 12 ft wide was attached to pier #2 by a 102.3 ft wide bear trap dam that extended to pier #2 (48 ft in length and 14 ft in width). Pier #2 was subsequently attached to pier #3 by a 102.4 ft bear trap dam. Pier #3, approximately 48 ft long and 12 ft in width was connected to the west bank abutment by a 164 ft weir expanse of Chanoine wickets. Chanoine wickets had been invented in 1852 by Jacques Chanoine of the French Corps of Engineers and somewhat resembled huge wooden ironing boards (Johnson 1987: 137).

A 250 ft section of the dam that attached to the river wall on the east bank of the Ohio River was completed by late-1903. Work on the dam slowed until 1905 when Congress, under the River and Harbor Act of 1905 appropriated funds for securing a 9 ft stage in the pools made by Dams #2-6 on the Ohio River (U.S. Army Corps of Engineers 1979: 26). Under a supplemental agreement with Baker Contract Company, dated March 1, 1905, work was initiated on the navigable pass section of the dam. The remaining sections of the dam complex were completed between 1905-07.

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The width of the navigable pass at Ohio Slack Water Dams, Lock and Dam No. 4 was 652 ft. The function of the pass was to provide a channel for open river navigation when the use of the dam was not required and the wickets were down, in addition to forming a part of the dam (by the raising of the wickets) with which the pass was provided. Each wicket measured 4 ft in width and 12.9 ft in length. The wicket proper was a heavy timber shutter pivoted to a link-like frame called a "horse," which in turn was pivoted to the foundation of the pass (Klein and Klein 1950: D-7).

When the wickets were to be raised to close a navigable pass, they were grabbed for and raised one at a time by a maneuver boat. The pass was worked by a maneuvering boat, made of steel. The wicket winch was located in the center of the boat, and the line from the winch, by which the wicket was raised, changed its direction by passing over a steel sheave mounted at the bow. Eight outriggers, suspended on the side of the boat, served a double purpose, and formed a platform for the workmen and kept the boat far enough from the face of the dam to permit the breech of the wicket that was raised to swing past the sheave to its seat against the main sill of the dam. On the outer ends of each of the two forward outriggers a buffer approximately 4.5 in thick, 1 ft wide, and 6.6 ft long, was fixed and rested against the wickets when raised. These buffers had a high and low position, the former for working in low water and the latter in high water. This served the purpose of keeping the point of bearing on the wicket below the axis of rotation, to prevent the wicket swinging when the pressure required to raise the wickets was brought upon it. The line from the winch in the boat had a maneuvering pole attached to its end, and the end of this pole had a hook with which the operator grappled the wickets. The location of the wicket to be raised could be fixed by the last wicket raised. Rarely would a hook have to be cast more than twice (Thomas 1898: 508).

As the wicket was pulled upward and forward (i.e., upstream), the prop attached to the horse followed a cast-iron groove until the lower end dropped into place against the shoulder or step. Once the prop was in place, the wicket was tipped from a nearly horizontal to a vertical position (less 20 degrees) with the lower edge resting against the sill of the pass and the middle braced in position by the prop. The reverse of this operation constituted the lowering of the wicket; for example, the wicket was first pulled slightly upstream, which had the effect of disengaging the prop from its step; once out of the step, the prop slid downstream in its cast-iron groove, allowing the wicket to fall and, in falling, assumed a horizontal position on top of the pass foundation (Klein & Klein 1950: D-7).

The function of the bear traps (weirs #1 & 2) was to regulate the pool levels within certain limits without having to resort to the lowering of the wickets in the navigable pass. The bear-trap weirs were structures of iron, steel, and wood, in two leaves, hinged at their outer ends. The bear-traps also converted into sluices to allow the passage of accumulated debris. The lower leaf of each bear trap was a hollow structure like a pontoon, into which air was forced to increase its buoyancy by displacing water. By the united effect of this buoyancy and the pressure due to hydraulic head caused by raising the wickets in the navigable pass, the lower leaf rose into position, thus raising the upper leaf. When the bear-trap was up, it formed an A-like structure which was supposed to have some resemblance to the deadfall used in trapping bears. There were two bear traps at Dam #4 that functioned quickly and independently of each other to form a waste weir, so that the flow of water past the dam could be regulated. The bear-traps in weir

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#1 and #2 were constructed of 20 ft thick crib decking, overlayed with 14 ft of stone foundation. The deck cribbing constructed of white oak and hemlock planks were approximately 10 in x 1 ft x 20 ft in size and filled with stone; 1-2 ft³ in size. The bear-trap sill at dam #4 was approximately 670.905 ft above MSL.

In addition to the bear-trap weirs, Dam #4 had a 164 ft section of Chanoine weir (weir #3), that served as a repetition of the navigable pass, although its sill was placed at a higher level and having, in consequence, wickets of shorter length. The Chanoine weir #3 was utilized similar to the bear traps to regulate the pool levels, but they were not essential to the operation of the dam (Klein & Klein 1950: D-10). The Chanoine weirs could also function to adjust the pool level at flows where the navigable pass was up and there was danger of the wickets being overtopped (U.S. Army Corps of Engineers 1979: 32). The 166 ft weir #3 was supported by a 20 ft thick crib decking, underlayed with a 20 ft thick foundation of stone. The sill of weir #3 was at approximately 671.393 ft above MSL.

The abutment of dam #4 constructed in 1907, was located on the west bank of the Ohio River on a parcel of land acquired from the Jones and Laughlin Steel Company. The abutment, constructed of timber piles, concrete and stone cribs built of oak, beech, and hemlock, encompassed a frontage of approximately 233 ft. The abutment was connected to weir #3 by a concrete retaining wall. All sections of the west bank abutment were subsequently removed by later industrial concerns and have not been preserved.

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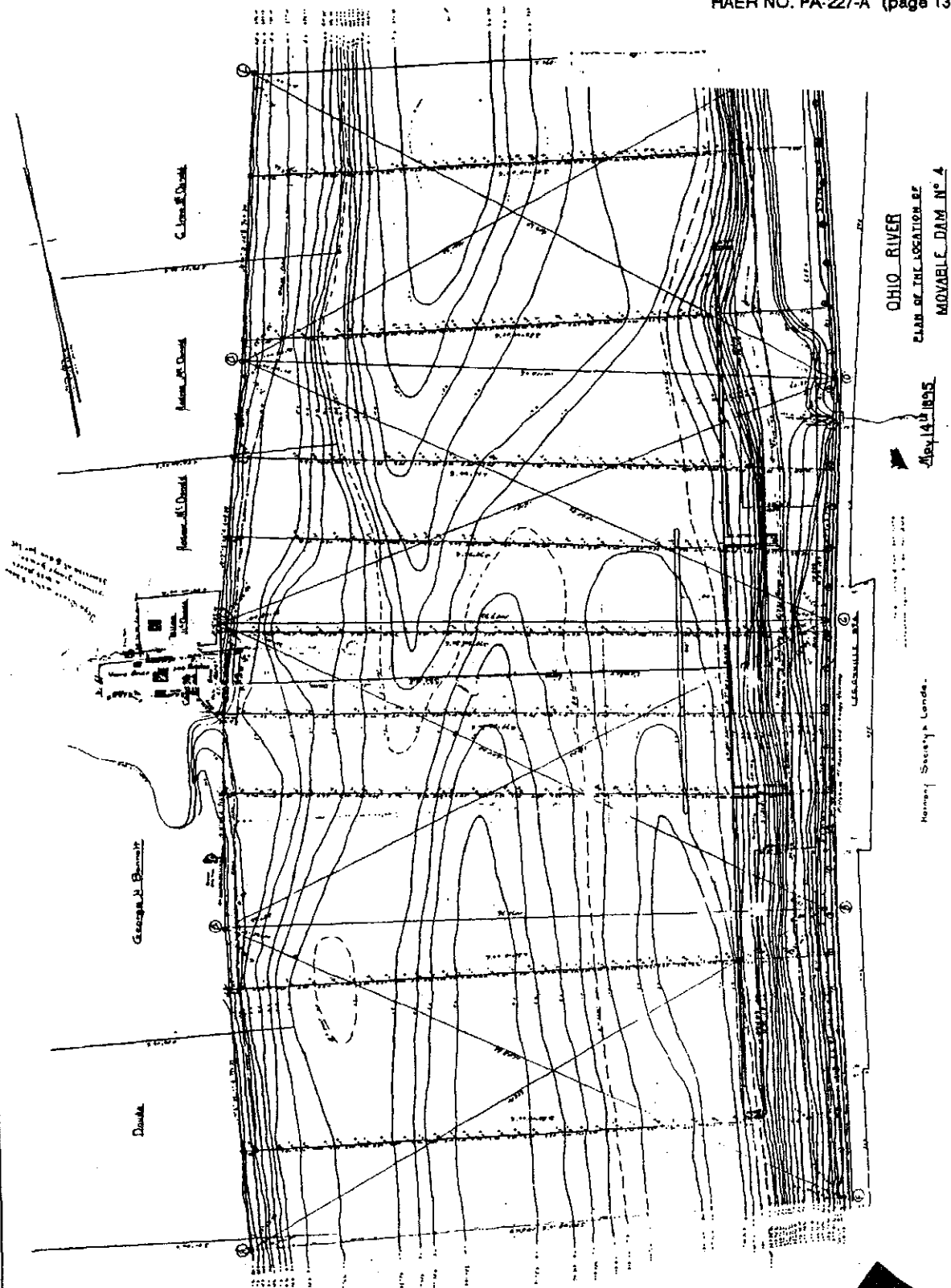
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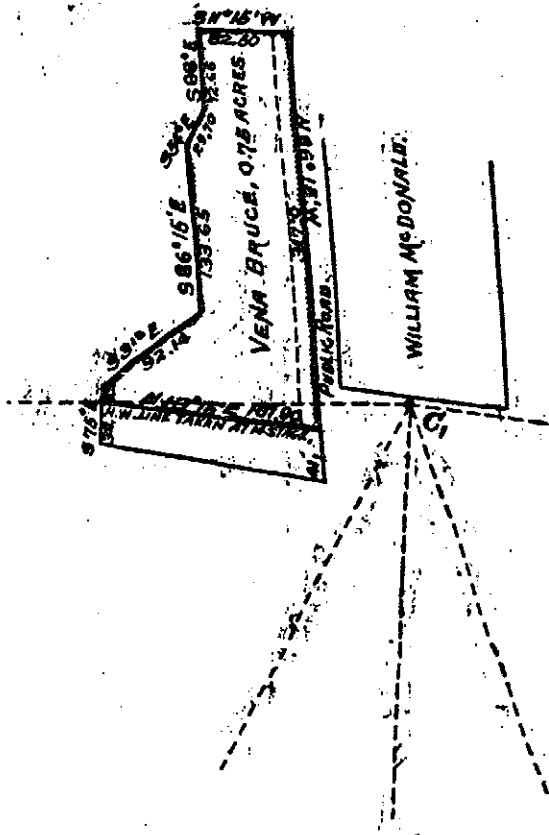
PLAN OF MAY 14, 1895, U.S. ARMY CORPS OF ENGINEERS,
PITTSBURGH DISTRICT.

OHIO RIVER
PLAN OF THE LOCATION OF
MOVABLE DAM NO. 4

MAY 14, 1895

H. S. L. L.

SCALE: 1" = 330'



Ohio River Movable Dam No. 4.

JANUARY 20, 1897.

Description of the land of VENA BRUCE to be appropriated for use of MOVABLE DAM No. 4.
Beginning at a point on high water line and the center of a public road; thence N 88 deg. 15 min. W, 317 feet; thence S 11 deg. 15 min. W, 82.50 feet; thence S 88 deg. E, 72.65 feet; thence S 54 deg. E, 29.70 feet; S 88 deg. 15 min. E, 133.65 feet; S 31 deg. E, 92.14 feet; thence S 75 deg. E, 8.20 feet; thence N 13 deg. 15 min. E, 181.90 feet to the place of beginning, containing 0.75 acres.

Copy sent to Chief of Engineers U.S.A.
March 15, 1897.

W.H. Heusen
Maj. Eng'r

SCALE: 1" = 74'

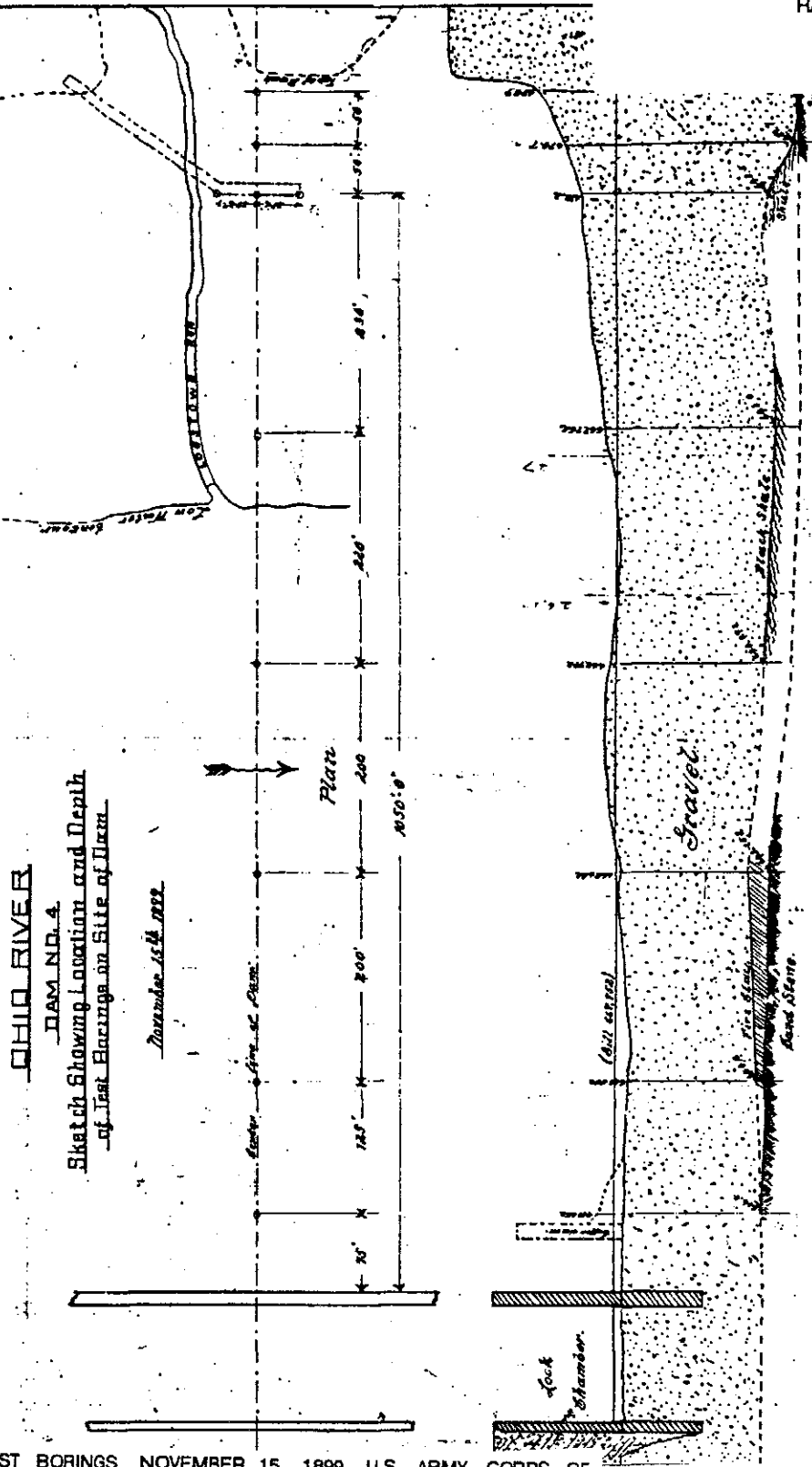
Ohio River movable Dam No. 4.

Preserved 1897.
Description of Land of the HARMONY SOCIETY, to be purchased for the use of Movable Dam No. 4.
Beginning at a point on the Western boundary of the property of C. A. Tyley of way distant about
one mile from the town of Liberty, Ohio, the line of the Harmony Society, to be a point on the river
about 100 feet north of the line of the Liberty House, thence 200 ft. 0 in. to a point on the river
of the water line of Liberty House, thence along said low water line in a general southerly
direction, about 100 feet, thence 200 ft. 0 in. to a point on the above described line, thence
to the place of beginning, containing 4 acres, more or less above ordinary high water mark.

Land of the Union Company, (Harmony Society) needed for site of Lock and Dam No. 4.

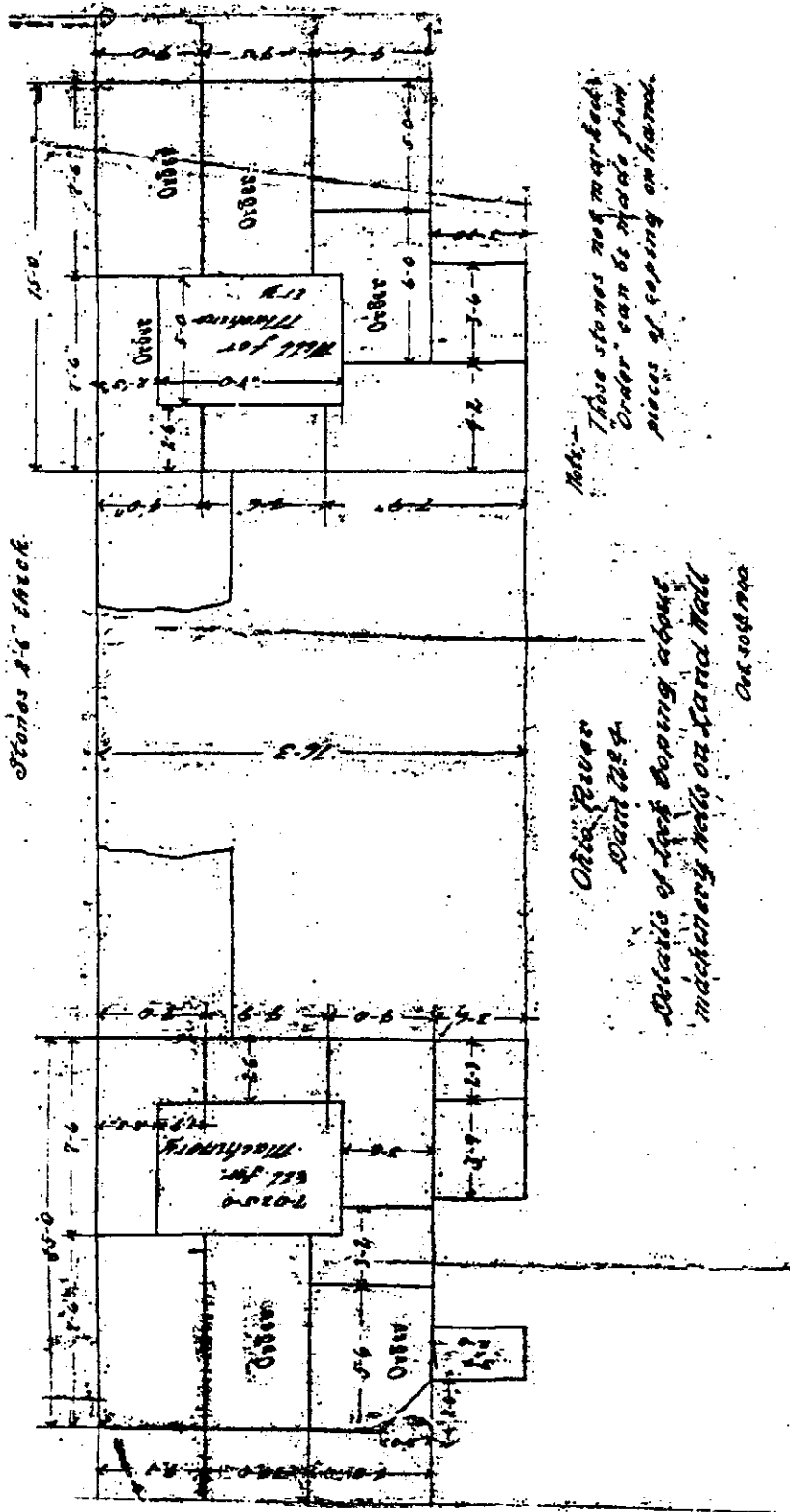
Lebanon Sta.

SCALE: 1"= 160'



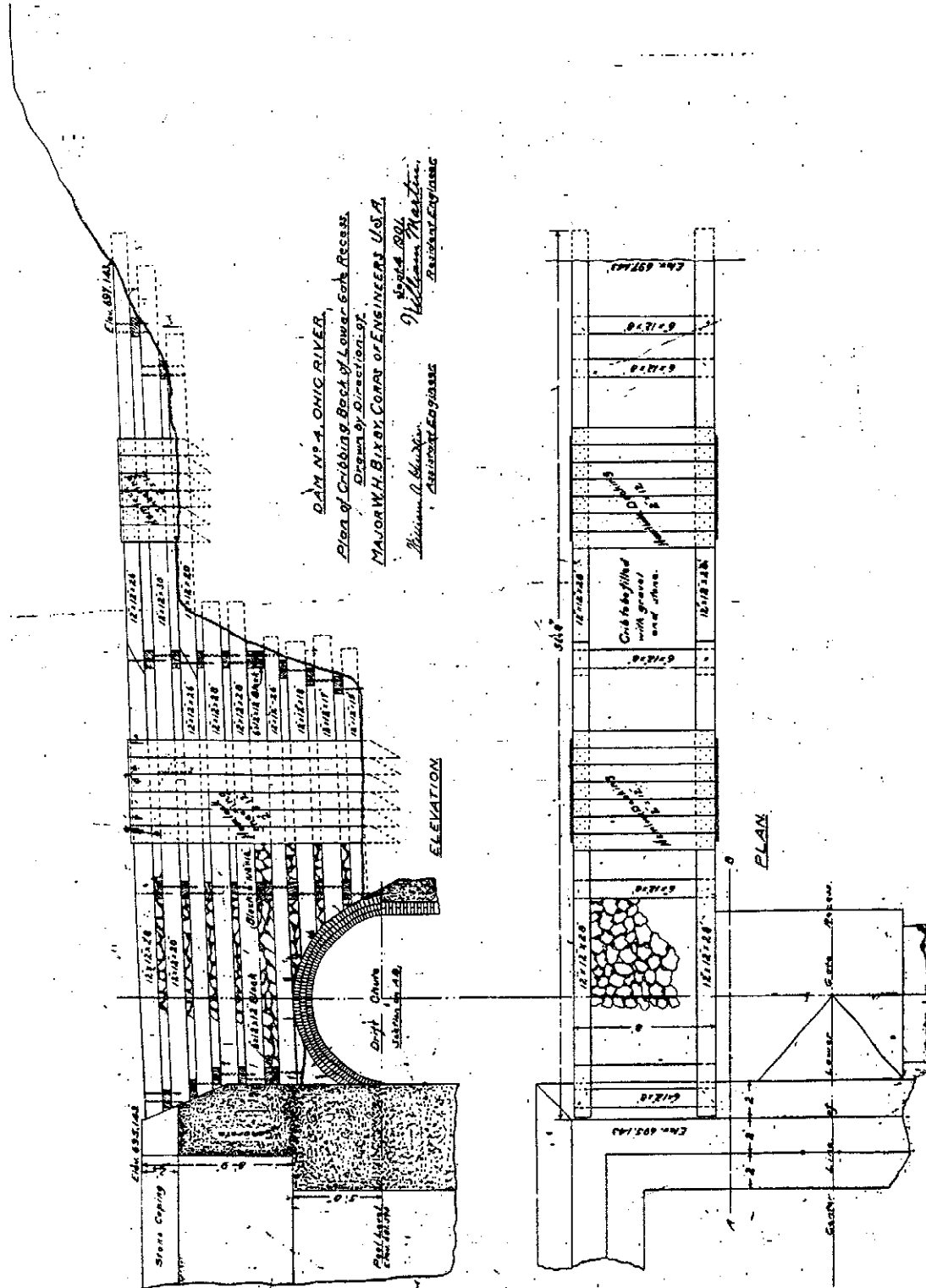
TEST BORINGS, NOVEMBER 15, 1899. U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT.

SCALE: 1" = 167'

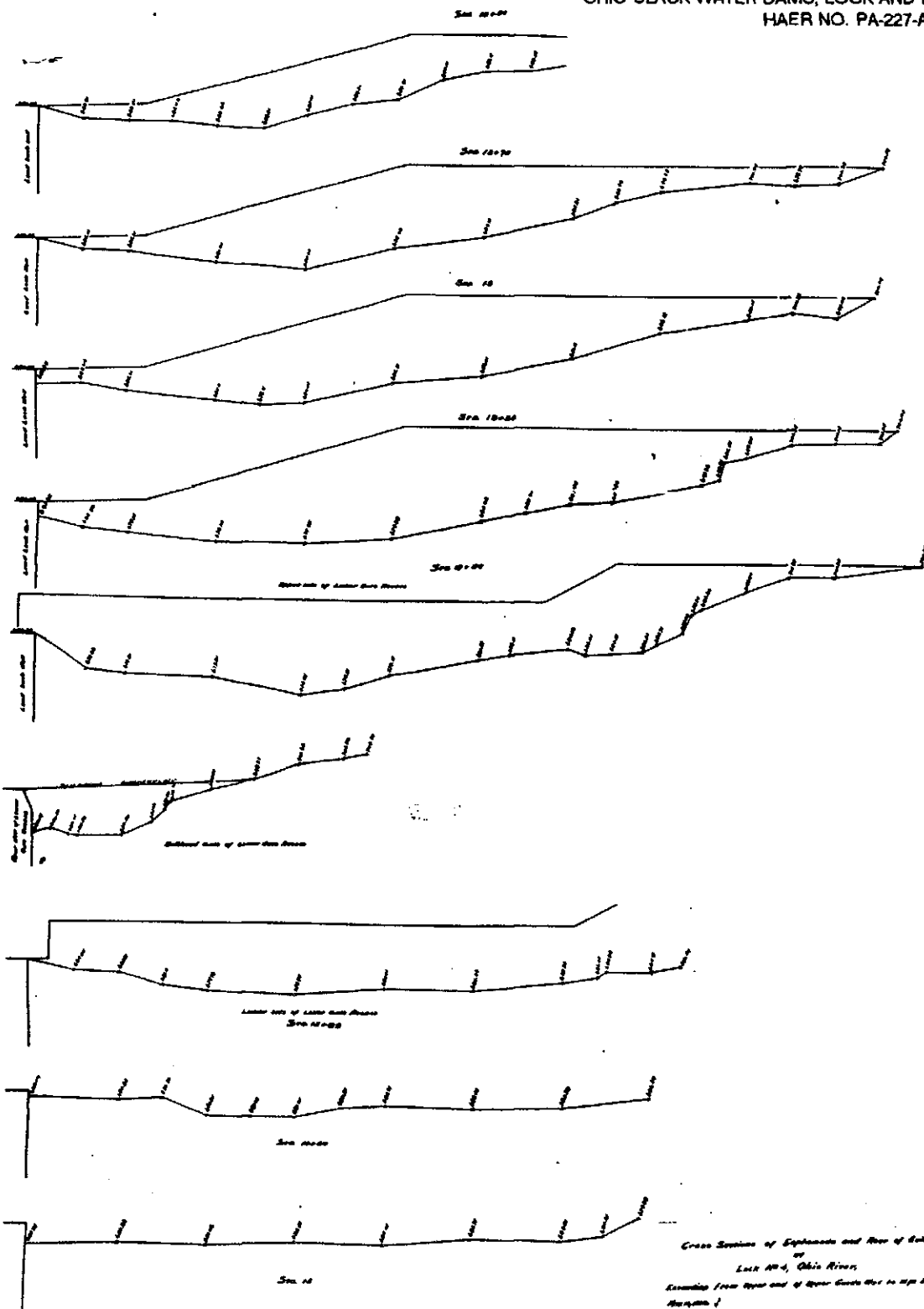


LOCK COPING, OCTOBER 30, 1900. U.S. ARMY CORPS OF ENGINEERS,
PITTSBURGH DISTRICT.

SCALE: 1"= 7'



CRIBBING-BACK OF LOWER GATE RECESS SEPTEMBER 4, 1901. U.S.
ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT.

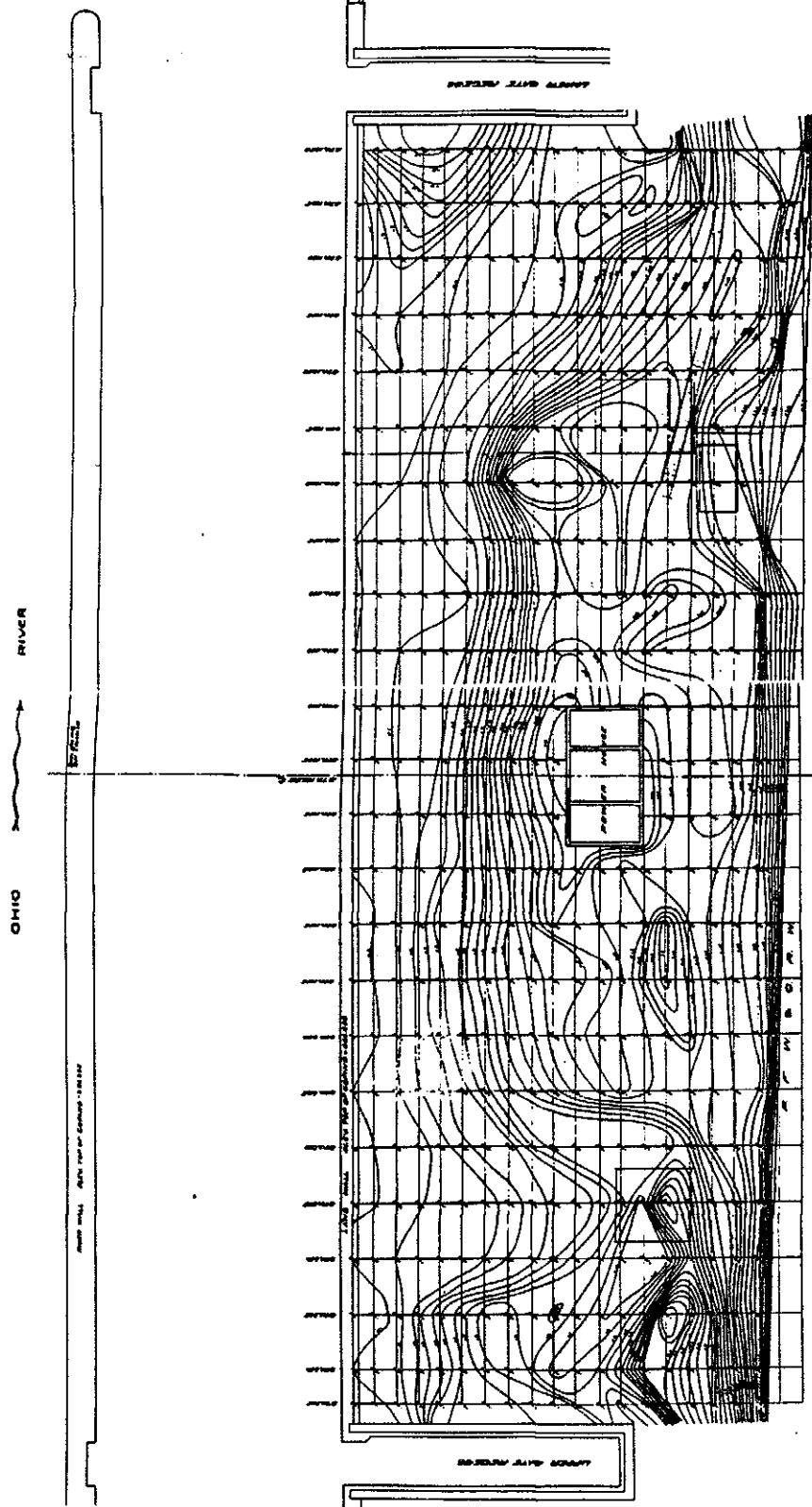


SCALE: 1" = 18'

CROSS SECTION, ESPLANADE AND GUIDE WALLS, MAY 19, 1902, U.S.
ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT.

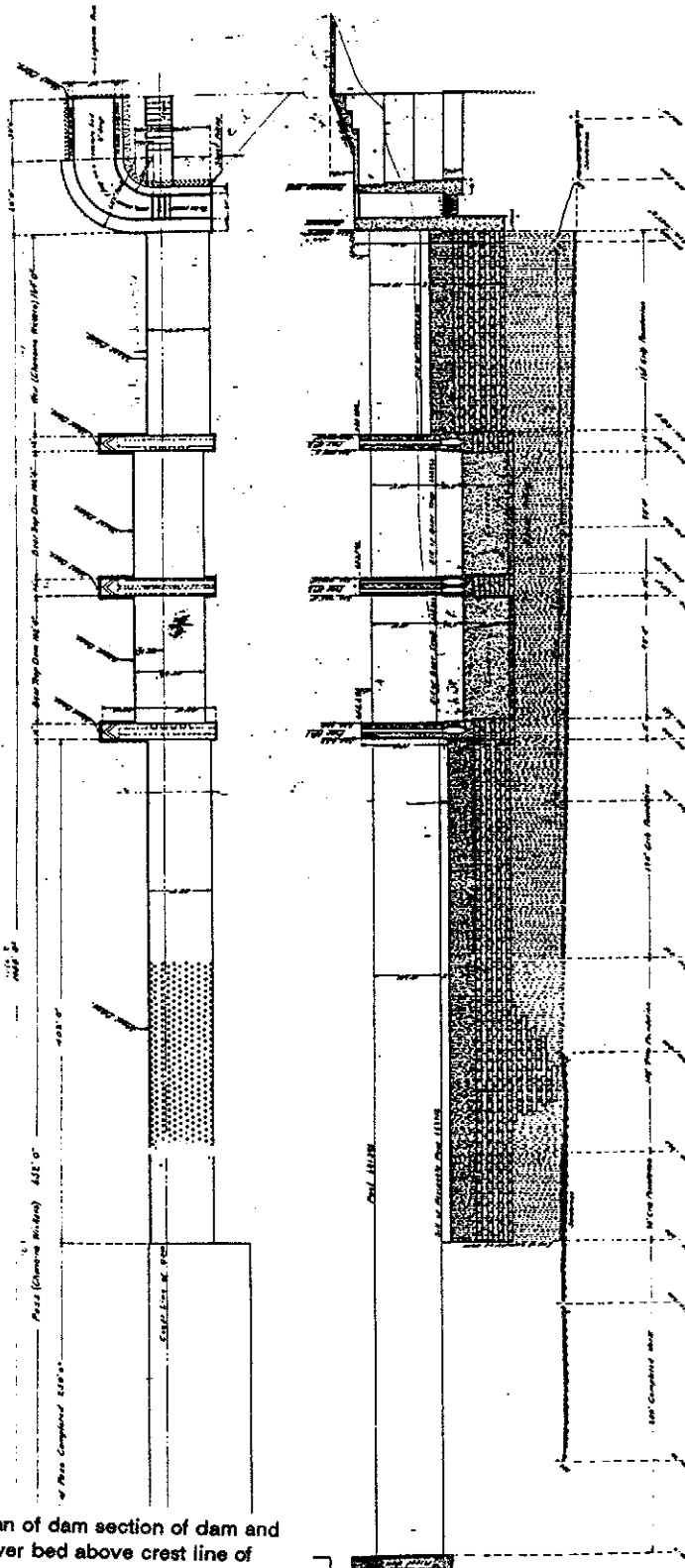
Cross Section of Esplanade and River of Guide Walls
at
Lock No. 4, Ohio River,
Extending from Upper and of River Guide Wall to Upper Guide Wall
River, etc.
This view direction of

Capt. H. E. Craighead,
Corps of Engineers, U.S.A.



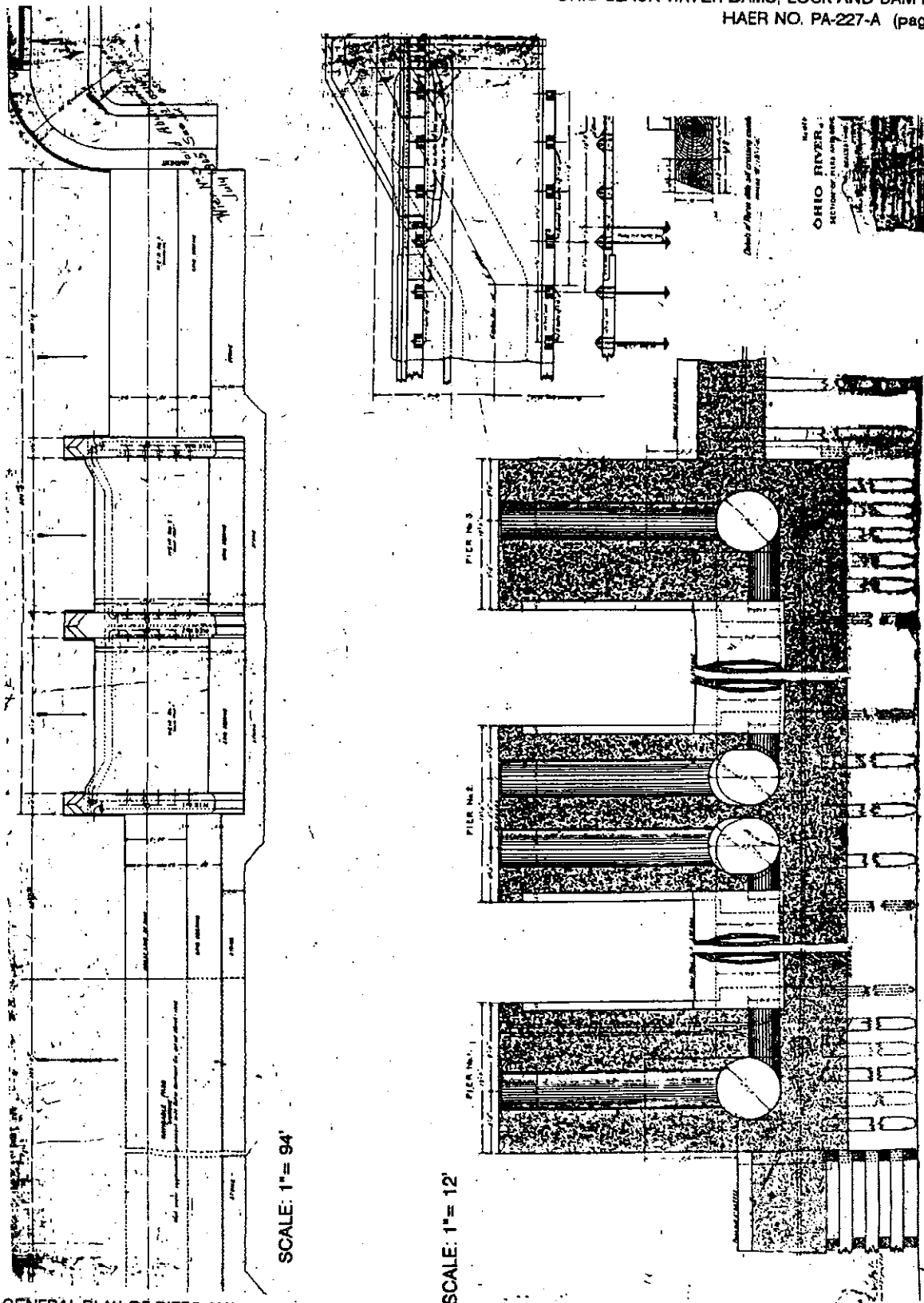
CROSS SECTION, ESPLANADE, DECEMBER 1903. U.S. ARMY CORPS
OF ENGINEERS, PITTSBURGH DISTRICT.

SCALE: 1" = 70'

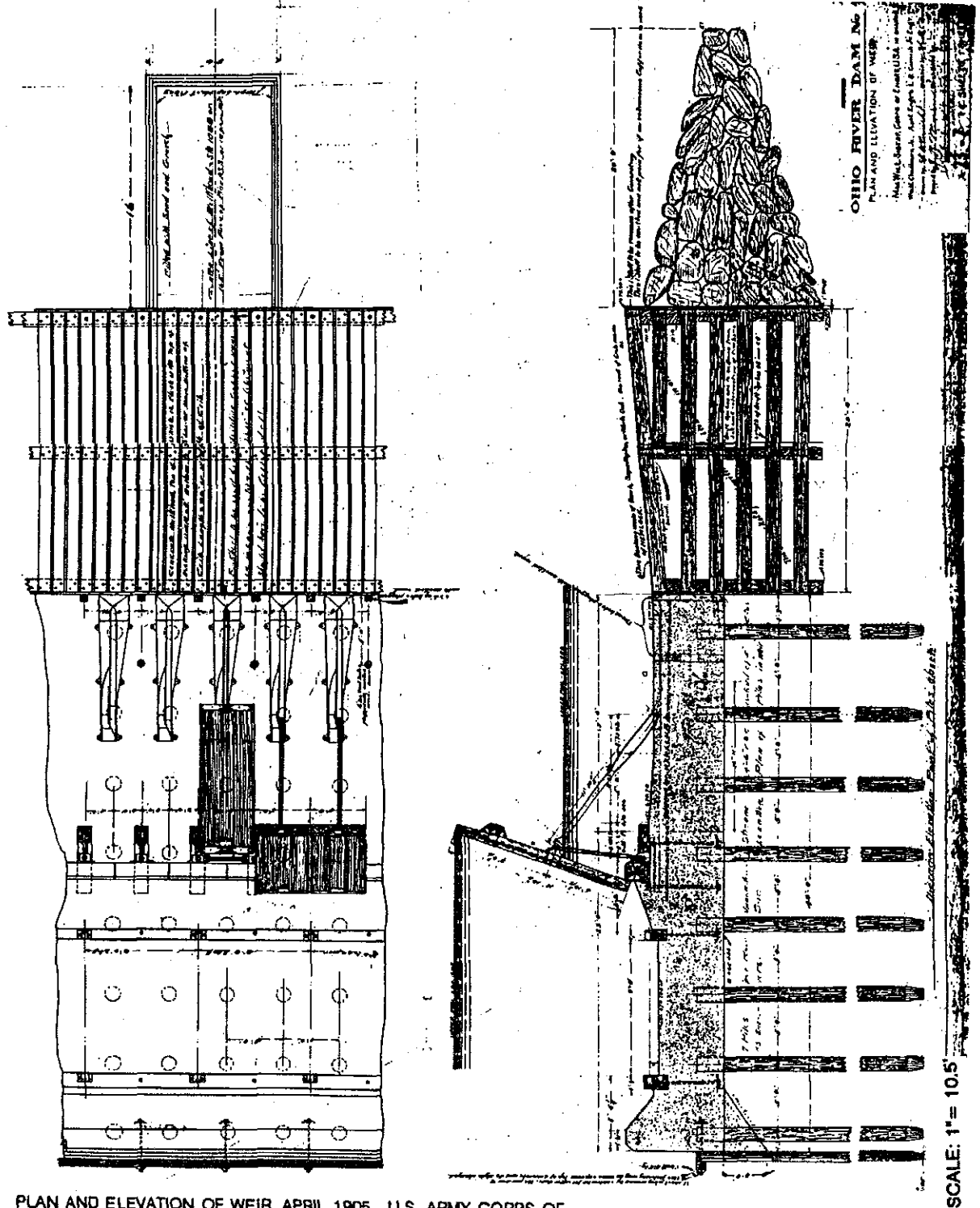


SCALE: 1" = 155'

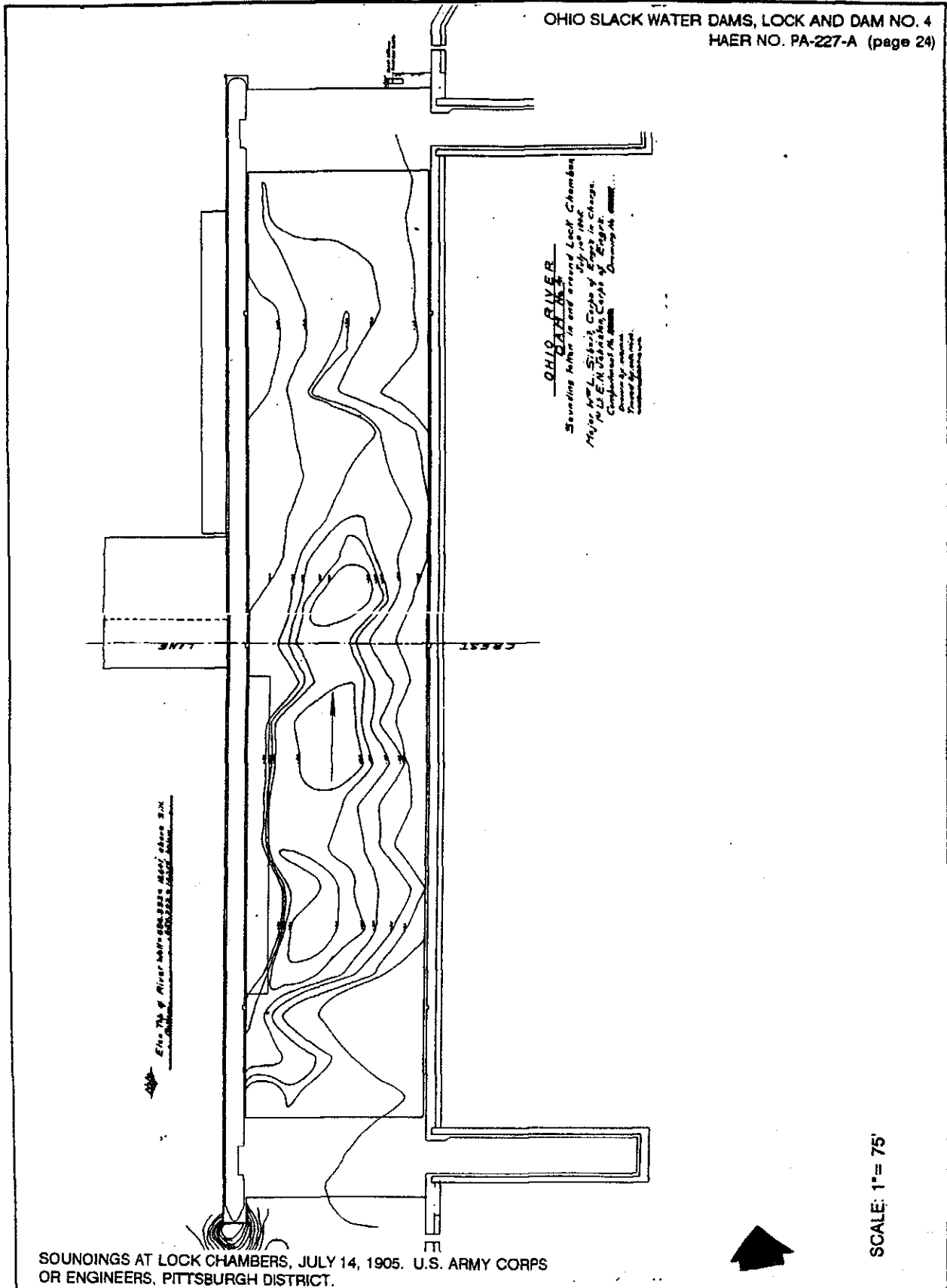
SCALE: 1" = 155'

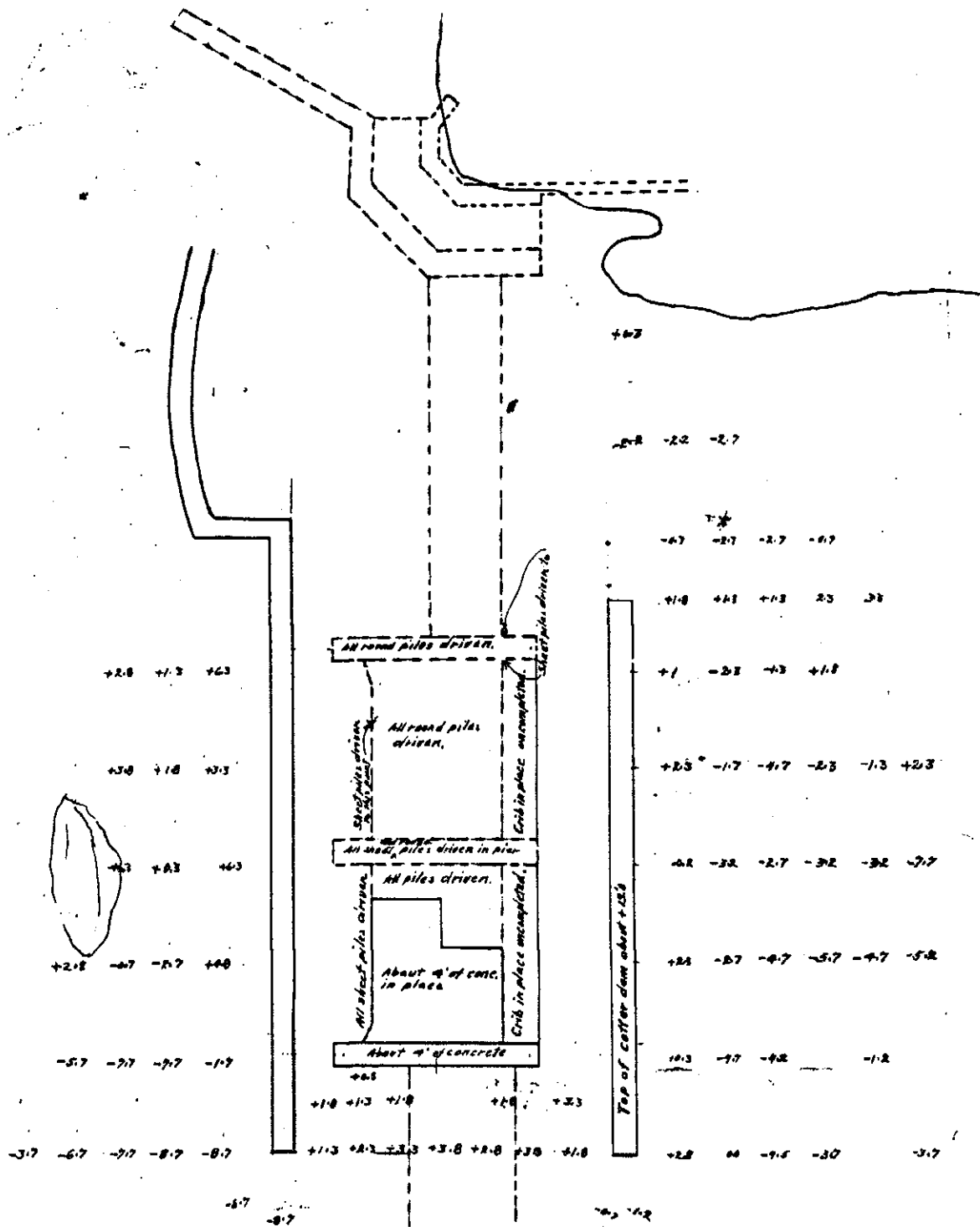


GENERAL PLAN OF PIERS AND DAMS, APRIL 1905. U.S. ARMY CORPS
OF ENGINEERS, PITTSBURGH DISTRICT.



PLAN AND ELEVATION OF WEIR, APRIL 1905. U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT.



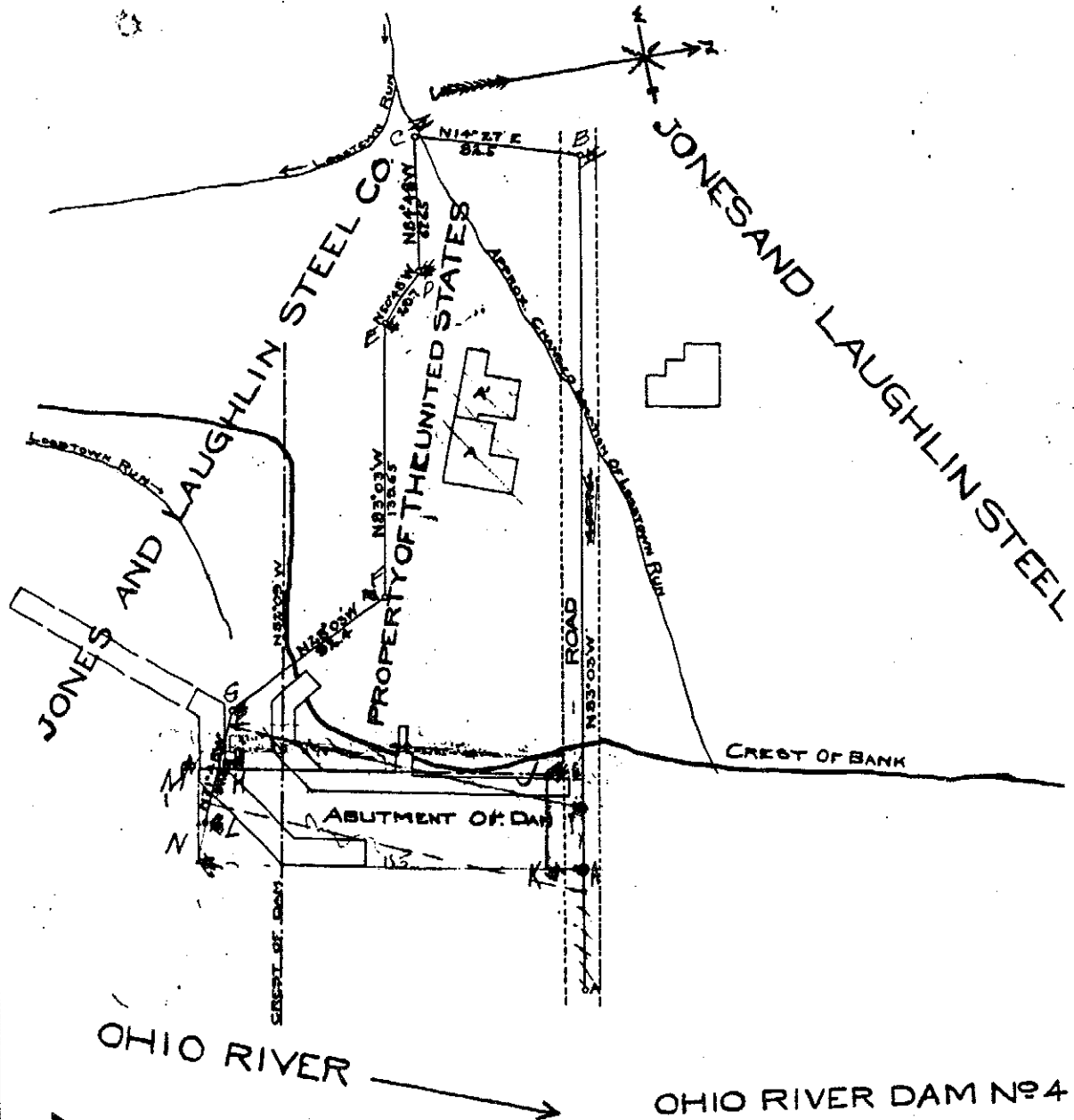


SCALE: 1" = 73'

COFFER DAM, MAY 18, 1906, U.S. ARMY CORPS OF ENGINEERS,
PITTSBURGH DISTRICT.

OHIO RIVER DAM No. 4.

Sketch showing conditions about coffer dam.
May 18 1906.



OHIO RIVER DAM No 4

SKETCH SHOWING PROPOSED EXCHANGE
OF LAND BETWEEN JONES AND LAUGHLIN
STEEL CO. AND THE UNITED STATES
Major Wm. L. Sibert, Corps of Engineers

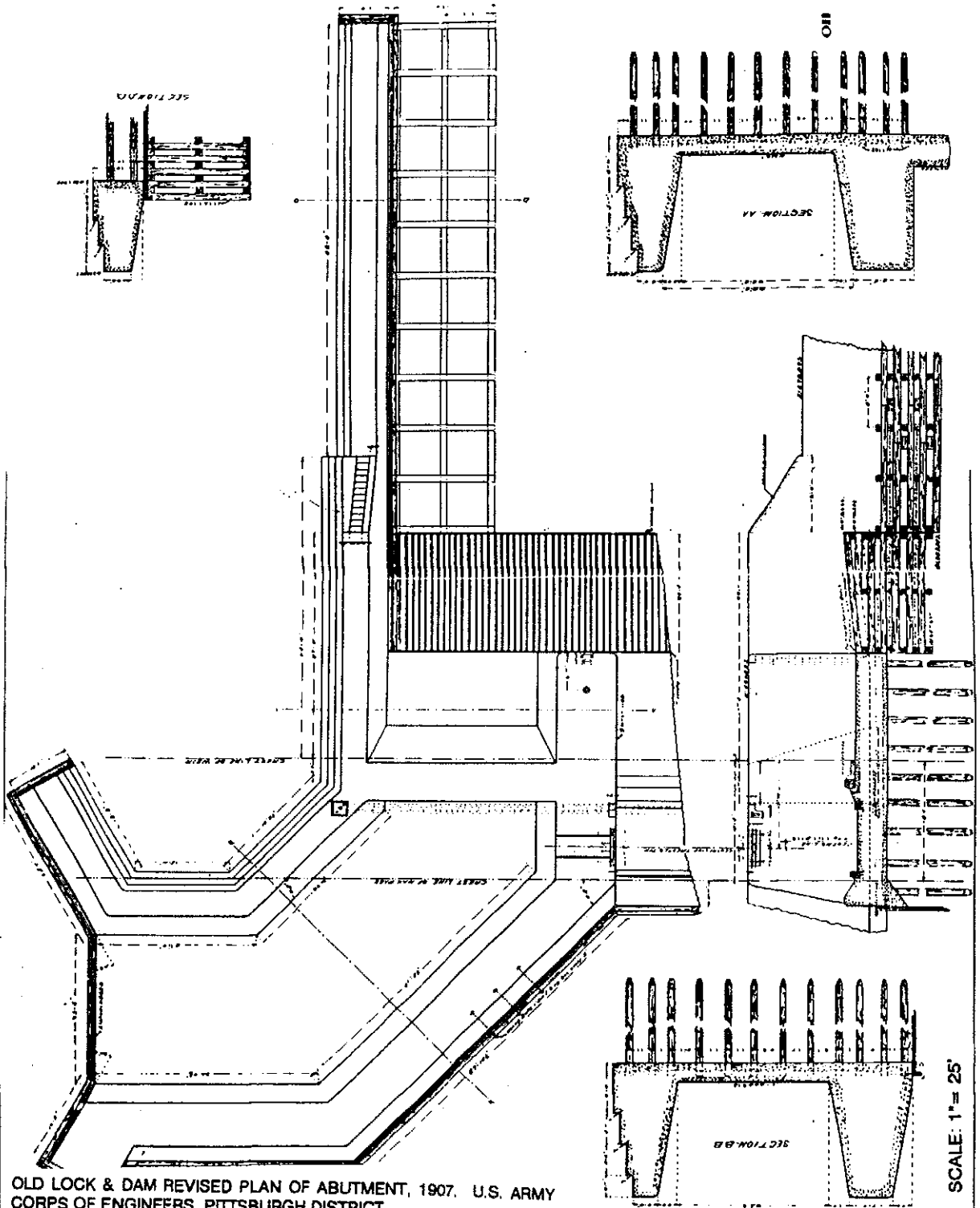
Traced By *Chas. E. Shupe*

Nov. 5, 1906

File No D22-18

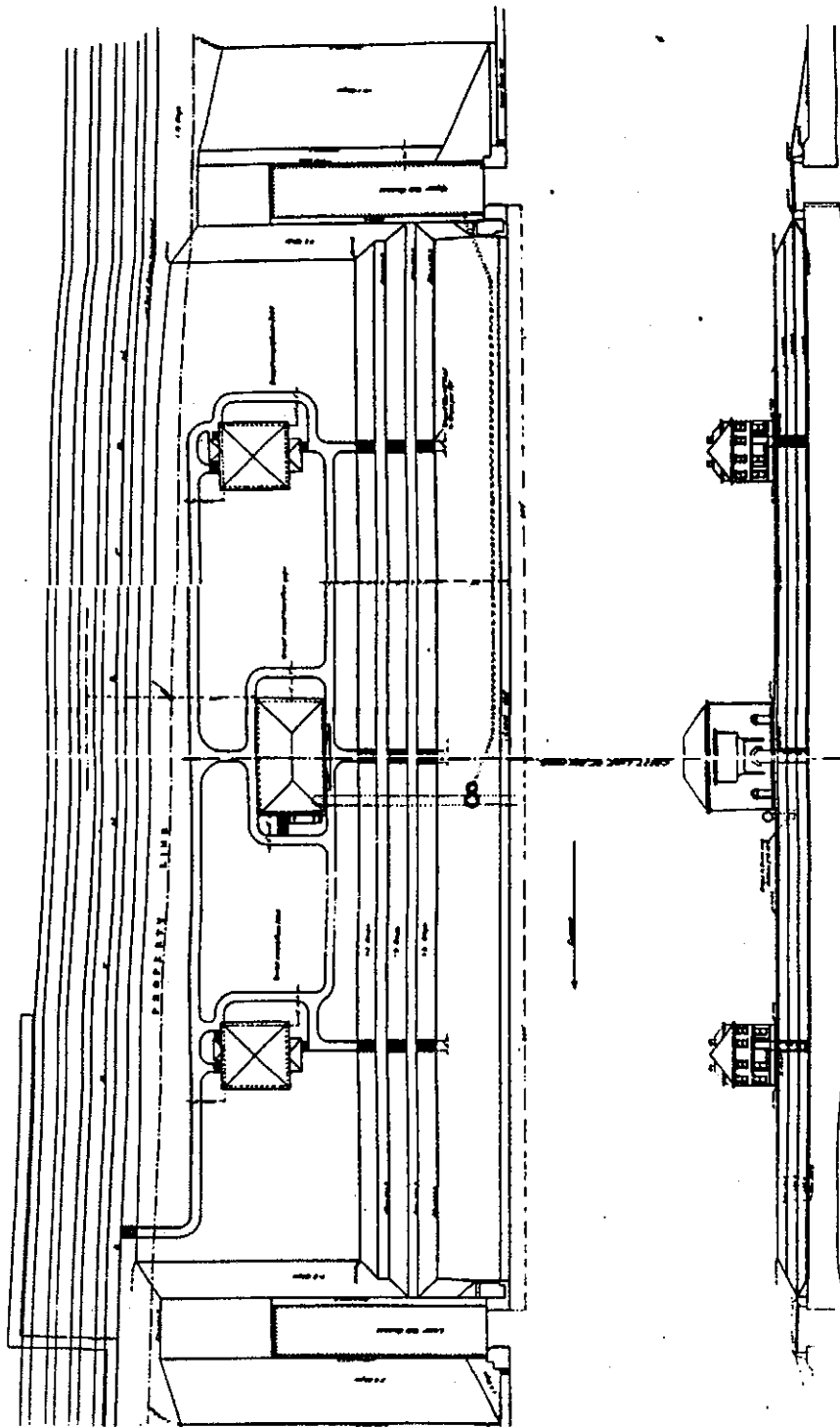
SCALE: 1" = 57'

LAND EXCHANGE ON WEST BANK, NOVEMBER 8, 1906. U.S. ARMY
CORPS OF ENGINEERS, PITTSBURGH DISTRICT.



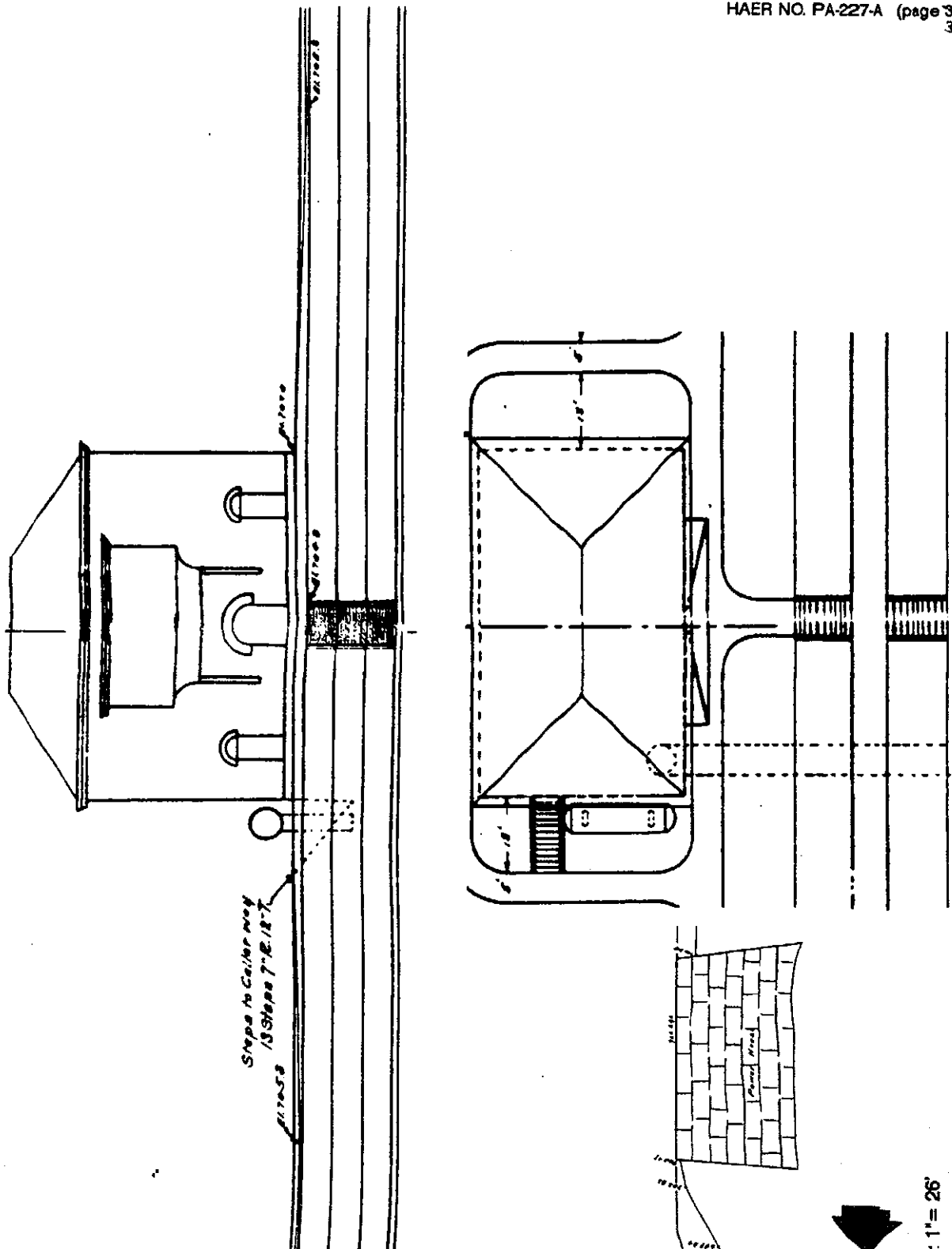


SECTIONS OF LOCK WALLS, MAY 1907. U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT.



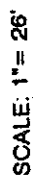
PLAN OF LOCK COMPLEX (CA. 1907) ONLY PLAN AVAILABLE, MAY NOT BE FINAL PLAN. U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT.

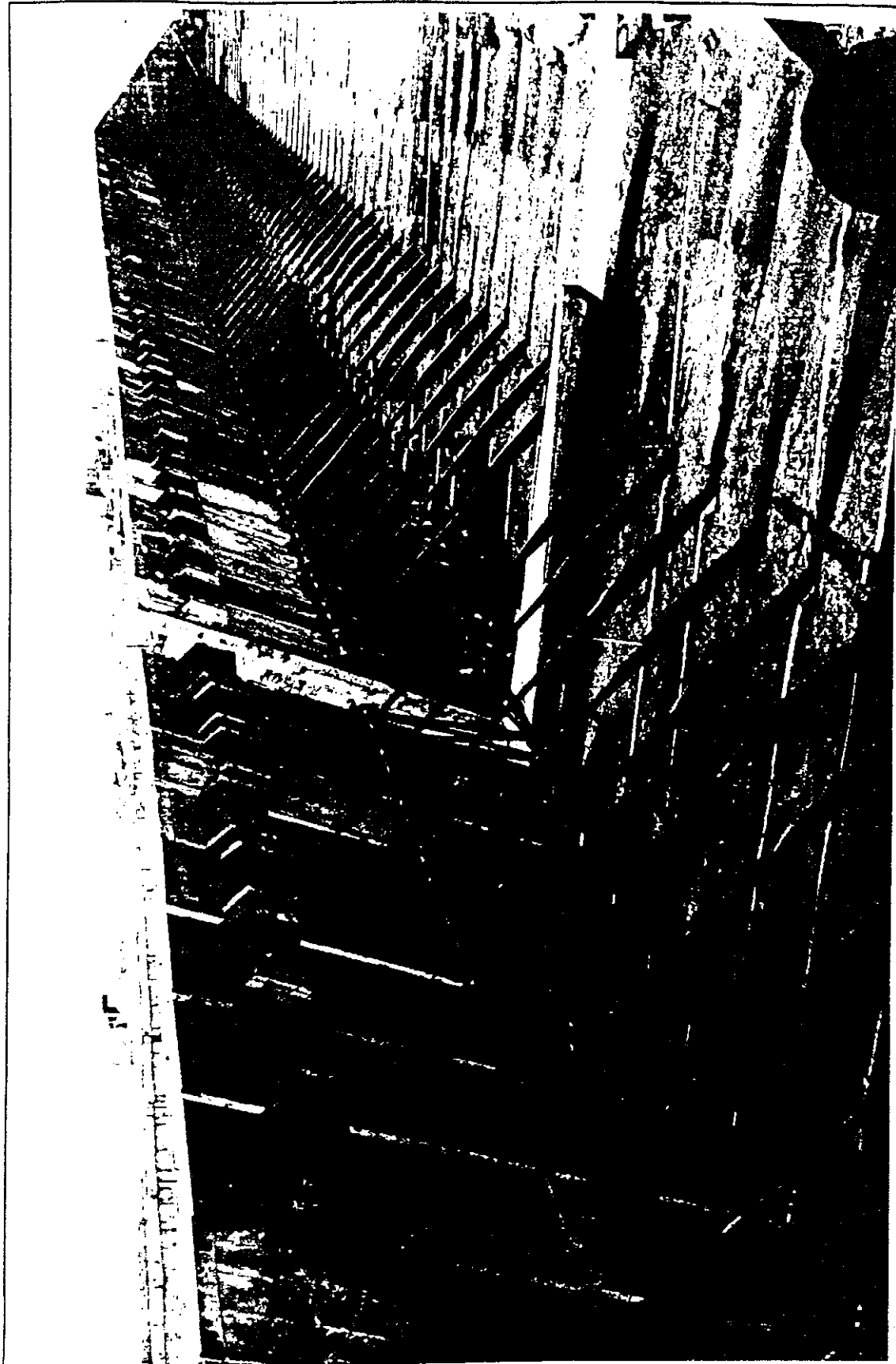
SCALE: 1" = 102'



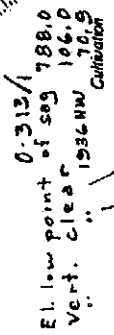
PLAN OF LOCKTENDERS HOUSE (CA. 1907) ENLARGED FROM ORIGINAL, BUT MAY NOT BE FINAL PLAN OF SITE. U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT.

SCALE: 1" = 26'





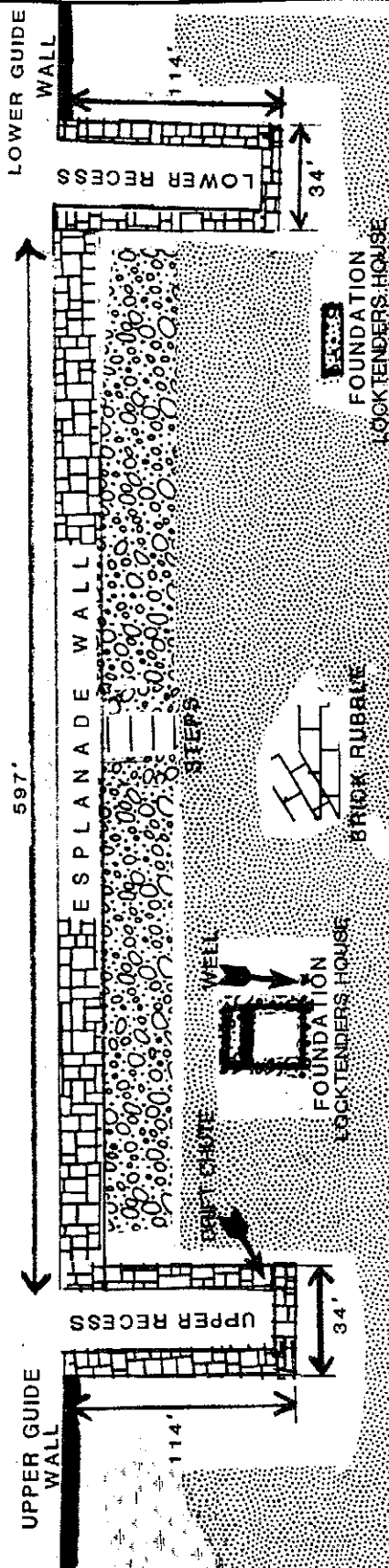
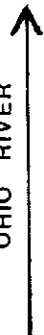
WICKETS UNDER CONSTRUCTION OCT. 26 1907
U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT



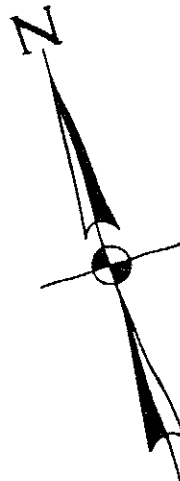
SCALE: 1"=525'

PLAN OF PRESERVED FEATURES AT OLD LOCK & DAM #4, OHIO RIVER, DECEMBER 1992 SE TECHNOLOGIES, INC. CRMG, BRIDGEVILLE, PA.

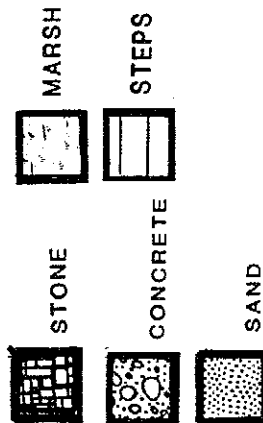
OHIO RIVER

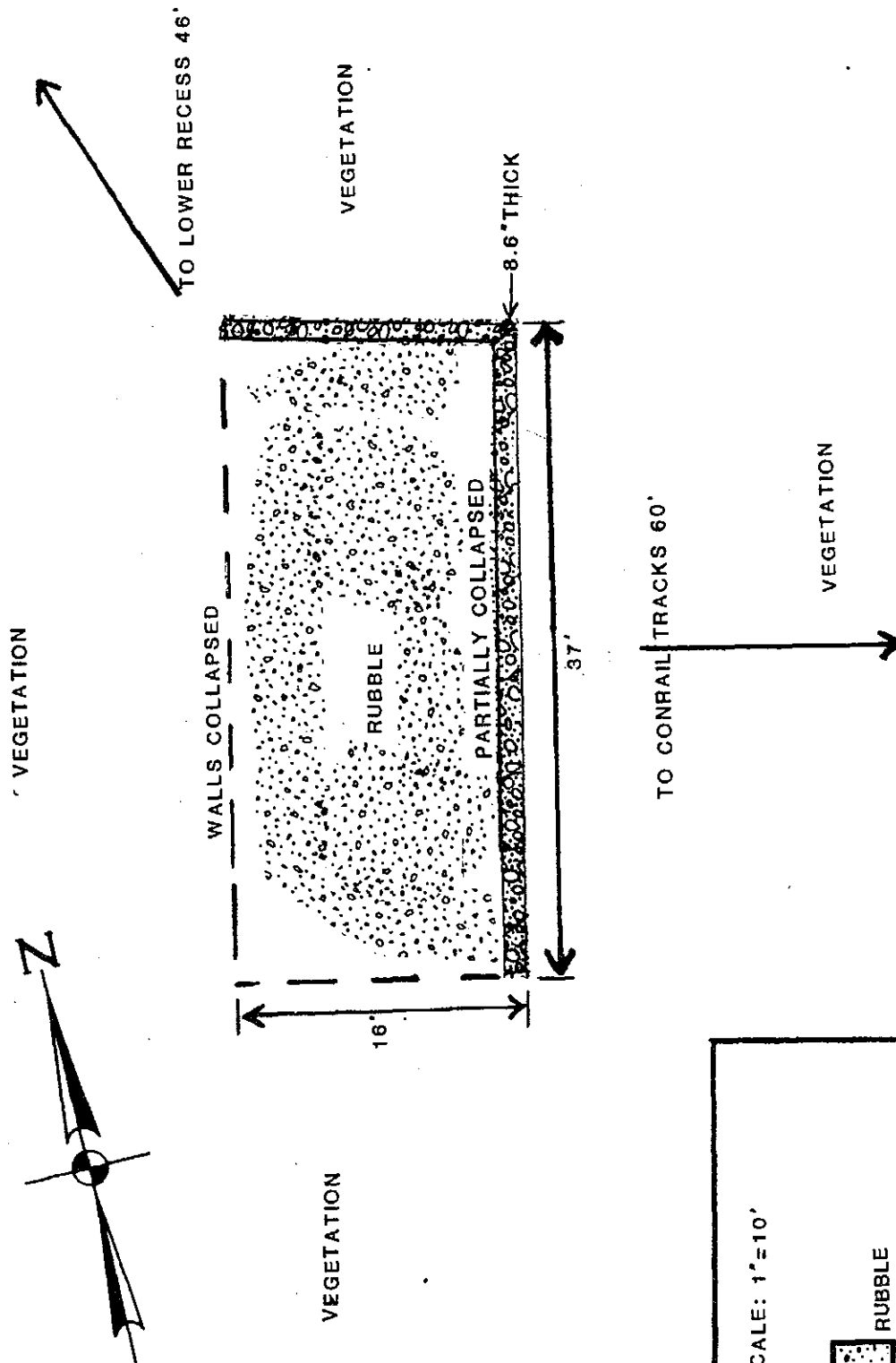


CONRAIL RAILROAD LINE



SCALE: 1"=100'





FOOTPRINT OF LOCKTENDERS HDUSE, (NORTHERN) DECEMBER 1992.
SE TECHNOLOGIES, INC. CRMG, BRIDGEVILLE, PA.

